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EXAMINER	
VAN ROY, TOD THOMAS	

ART UNIT	PAPER NUMBER
2828	

NOTIFICATION DATE	DELIVERY MODE
07/03/2007	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary

Application No.

10/803,042

Applicant(s)

ISHIDA ET AL.

Examiner

Tod T. Van Roy

Art Unit

2828

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 April 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-31 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-31 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 04/11/2007 has been entered.

Response to Amendment

The examiner acknowledges the amending of claims 1, 12, and 23.

Response to Arguments

Applicant's arguments filed 04/11/2007 have been fully considered but they are not persuasive.

With respect to the rejections over Kasai (namely claims 23 and 30), the Examiner does not agree that the previously indicated circuit components do not read on the current set of claims. The Examiner does agree that fig.3 of Kasai does label element #13 as a PWM signal outputting circuit, however, element #23 is believed to read on the claims as it is a modulation unit that generates output signals. These signals are then applied to #13, and further to the laser driver.

For the following discussion, and the claim rejections, the Examiner is interpreting the meaning of "spatially separated block" to mean groups of circuit components not occupying the same space.

With respect to the rejections over Ema (namely claim 1), the previous rejection is rewritten for clarity. It is also believed that the diagrams shown in figs.10 and 11 can be considered showing spatial separation. The circuit components (such as #112 and #107) would not be found on top of each other, therefor, they are spatially separated.

With respect to the rejections over Hironari (namely claim 1), the Examiner does not find the Applicant's arguments persuasive in showing the difference between the differential signal (Dv) shown in Hironari's fig.3, and that of the claimed small-swing differential signals. In addition, the Examiner points to the similarities of fig.3 of Hironari and Applicants figs.5-6.

With respect to the rejections over Thompson (namely claim 1), the Examiner disagrees with the Applicant that the circuit components can be considered spatially separated for substantially the same reasons as given with respect to Ema above.

Please see the updated rejections below.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent

Art Unit: 2828

granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 23-28, 30, and 31 are rejected under 35 U.S.C. 102(b) as being anticipated by Kasai (US 6,246,705).

As for claim 23 Kasai discloses in figures 2 and 3, a laser modulating and driving device comprising: a pixel data generating unit 21 configured to produce pixel data and formed in a first block 200; a modulation signal generating unit 23 configured to generate a low-voltage (low is a relative term without definition, the voltage signals sent across the bus of Kasai can be considered low level) laser modulation signal from the pixel data and formed in the first block 20 together with the pixel data generating unit 21; a driving unit 11 configured to drive a laser according to the laser modulation signal supplied from the modulation generating unit and formed in a second block 100 spatially separate from the first block; and a signal transmission line 30 connecting between the first block 20 and the second block 10 and transmitting the laser modulation signal.

As for claim 30 Kasai discloses in figure 2, an image reproducing apparatus comprising: a photosensitive unit 5; a light source using a laser 2; a laser modulation signal generating unit 20 formed in a first block 200 and configured to produce a laser modulation signal consisting of a pair of small swing differential signals based on pixel data; a driving unit 10 formed in a second block 100 spatially separated from the first block and configured to drive the laser according to the laser modulation signal; a signal transmission line 30 connecting between the first block 200 and the second block 100 for transmitting the laser modulation signal to the driving unit 10; and a deflecting optical

Art Unit: 2828

system 3 for guiding and deflecting a laser beam emitted from the light source 2 onto the photosensitive unit 5 to form a latent image thereon.

As for claim 24 and 31 Kasai discloses in figure2, wherein the first block and the second block are independent printed circuit boards (PCB).

As for claim 25 Kasai discloses in Figure 7, the modulation signal generating unit 23 has a small swing differential signal output circuit configured to output a pair of small swing differential signals as the laser modulation signal 23, the driving unit 11 has a small swing differential signal input circuit configured to receive said pair of small swing differential signals, and the signal transmission line (30, fig. 2) is configured to transmit said pair of small swing differential signals.

As for claims 26 and 27 Kasai discloses in fig. 4 and 5, the small swing differential signal output circuit has an output-stage circuit configured by a first logic (Pulse width signal, saturated or ECL), and the small swing differential signal (ramp output, unsaturated or CML) input circuit is configured by a second logic different from the first logic.

As for claim 28, Comparators and Op Amp's inherently have a pair of transistors. Therefore the limitations of the claims are met.

Claims 1-5 and 7 are rejected under 35 U.S.C. 102(b) as being anticipated by Ema et al. (US 5,946,334).

As for claim 1 Ema discloses, a laser modulating and driving device comprising: a modulation signal generating unit provided in a first block (fig.10 #112) and configured

Art Unit: 2828

to generate and output a laser modulation signal consisting of a pair of symmetrical (from fig.10 #112, see fig.11 I_{DA} and I_{DA}^* , also fig.13 image data) small swing differential signals based (See Column 2 lines 58-63) on pixel data; and a driving unit provided in a second block spatially separated from the first block (fig.10 #107) configured to drive a laser according to the laser modulation signal ILD supplied from the modulation signal output and generating unit (fig.10 #107). Differential signals may be caused by differences in current.

As for claim 2 Ema discloses, the modulation signal generating unit data has a modulation circuit configured to produce a modulation signal, and a small swing differential signal output circuit ILD configured to convert the modulation signal to said pair of small swing differential signals, and the driving unit has a small swing differential signal input circuit for receiving said pair of small swing differential signals.

As for claim 3 Ema discloses in figure 20, a non-inverted fig. 20B and inverted fig. 20C signal generating circuit configured to produce a non-inverted signal fig. 20B having the same phase as the modulation signal fig. 20A and an inverted signal with the phase shifted by 180 degrees from the modulation signal; and a small swing output circuit configured to reduce swings of the non-inverted signal and the inverted signal to output said pair of small swing differential signals as the laser modulation signal.

As for claim 4 Ema discloses in fig 19a (See 42/47-48), the small swing output circuit is formed as current mode logic (CML) or emitter coupled logic (ECL) (271; See 41/37-40).

As for claim 5 Ema discloses in fig 19a, a reference potential of the CML or ECL is a supply voltage VCC of the modulation signal generating unit (the circuit 271 is connected to up to Vcc).

As for claim 7 Ema discloses in fig 19a, the small swing differential signal output circuit further includes swing reducing means arranged before the CML or ECL to decrease the swing of the non-inverted and inverted signals input to the CML or ECL (See 42/1-9).

Claims 1, 2, 16 and 18 are rejected under 35 U.S.C. 102(b) as being anticipated by Hironari (JP H11-105336).

As for claim 1, Hironari discloses in drawing 1, A laser modulating and driving device comprising: a modulation signal generating unit provided in a first block (1) and configured to generate and output a laser modulation signal consisting of a pair of symmetrical (fig.3 Dv and [0023]) small swing differential signals based on pixel data (See abstract); and a driving unit provided in a second block spatially separated from the first block (2) and configured to drive a laser LD according to the laser modulation signal output and supplied from the modulation signal generating unit.

As for claim 2, Hironari discloses, wherein the modulation signal generating unit has a modulation circuit configured to produce a modulation signal 1, and a small swing differential signal output circuit configured to convert the modulation signal to said pair of small swing differential signals 3, and the driving unit 2 has a small swing differential

signal input circuit for receiving said pair of small swing differential signals. The circuit 3 would take turn the signal into differential circuits that are applied to it.

As for claim 16, Hinorari discloses, the modulation signal generating unit has an output-stage inverter or buffer having a ground terminal, to which a second voltage higher than a ground voltage is applied. Q3 (and Q4) create a voltage follower and 12 (and 13) create a current source. Q3 with 12 create a circuit that follows the voltage of the node (connected to Q2, R2 and Q3) with out drawing significant power from the node, and therefore forms a buffer to output of the node. And therefore meets the limitations of the claim.

As for claim 18, Hinorari discloses, the modulation signal generating unit has an output-stage inverter or buffer using a transistor (Q3 and 12 or Q4 and 13), and wherein at least one of a high potential (Q3 or Q4) and a low potential (12 or 13) that defines the a swing of said pair of small swing differential signals is generated by an ON resistance of the transistor.

Claims 1-4, 6, 9, 15-17, 20 and 21 are rejected under 35 U.S.C. 102(b) as being anticipated by Thompson (US 5444728).

As for claim 1 Thompson discloses in figure 7, a laser modulating and driving device comprising: a modulation signal generating unit provided in a first block 32 configured to generate and output a laser modulation signal consisting of a pair of symmetrical (col.13 lines 25-41, complements) small swing differential signals (D1 and D2) based on pixel data (See abstract); and a driving unit provided in a second block

Art Unit: 2828

spatially separated from the first block (30 and 24) and configured to drive a laser 12 according to the laser modulation signal output and supplied from the modulation signal generating unit.

As for claim 2, the modulation signal generating 32 unit has a modulation circuit configured to produce a modulation signal, and a small swing differential signal output circuit configured to convert the modulation signal to said pair of small swing differential signals D1 and D2, and the driving unit (30 and 24) has a small swing differential signal input circuit for receiving said pair of small swing differential signals (bases of 256).

As for claim 3, the small swing differential signal output circuit includes: a non-inverted and inverted signal generating circuit configured to produce a non-inverted signal having the same phase as the modulation signal and an inverted signal with the phase shifted by 180 degrees from the modulation signal (see column 13 lines 32-35); and a small swing output circuit configured to reduce swings of the non-inverted signal and the inverted signal to output said pair of small swing differential signals as the laser modulation signal.

As for claim 4, wherein the small swing output circuit is formed as current mode logic (CML) or emitter coupled logic (ECL); see column 13 lines 2-6. Note the claim requires the circuit to be ECL or CML not the output.

As for claim 6, a reference potential of the CML or ECL is an intermediate potential lower than a supply voltage VCC of the modulation signal-generating unit.

There is current flowing through resistor 240 which would cause a drop in voltage from the supply voltage of +12V. Therefore the limitations of the claim are met.

As for claim 9 Thompson discloses, the small swing differential signal input circuit (30 and 24) has a differential signaling circuit-using transistors.

With respect to claims 12-14, Thompson teaches the apparatus outlined in the rejection to claim 1, including the spatially separation of the driving unit (fig.7 #30/24) from the modulating unit (fig.7 #32) via a transmission line (fig.7 D1/D2), and formation of a single integrated circuit (fig.7), and a pixel generating unit (fig.7 TTL to #250) configured to supply pixel data to the modulation unit (remainder of #32) formed on the same board.

As for claim 15, the modulation signal generating unit 32 has an output-stage inverter or buffer (236 or 232) having a supply terminal, to which a first voltage lower than a supply voltage (3.3 V) of the modulation signal generating unit is applied.

As for claim 16, the modulation signal generating unit 32 has an output-stage inverter or buffer (238 or 234) having a ground terminal, to which a second voltage higher than a ground voltage (3 V) is applied.

As for claim 17, the modulation signal generating unit has an output-stage inverter or buffer having a supply terminal (236,232,238, or 234), to which a first voltage lower (3.3 V) than a supply voltage of the modulation signal generating unit is applied (236 or 232), and a ground terminal (3V), to which a second voltage higher than a ground voltage is applied (238 or 234).

As for claim 20, Thompson discloses all that pertains to claim 1. Thompson further discloses, the modulation signal generating unit 32 is formed in a block spatially separated from the driving unit (30 and 24), and has an output-stage inverter or buffer (236 and 232 or 238 and 234) and a resistor 26 arranged outside the block to reduce a swing of an output of the output-stage inverter or buffer. The buffers 236, 232, 238 and 234 are commercially available chips (74F14 and DS0056) and therefore would have to be outside the block. Therefore all the limitations of the claim are met.

As for claim 21, Thompson discloses all that pertains to claim 1. Thompson further discloses, the modulation signal generating unit 32 has an output-stage inverter or buffer (232 and 236 or 234 and 238) and a resistor (252 or 254) connected to an output from the output-stage inverter or buffer (the resistor is connected to the buffer, therefore the limitation is met) to reduce a swing of the output from the output-stage inverter or buffer (intended use), and the driving unit (30 and 24) has an input-stage differential signaling circuit using a transistor 256.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kasai (US 6246705) in view of Kaminishi (US 6618406).

As for claim 29, Kasai discloses all that pertains to claim 23 respectively. However Kasai does not disclose that the input and output circuits of the small swing differential circuits use different supply voltages. Kaminishi discloses, "Since the control range of the DC bias current is large, here is used V_{cc} larger than V_{cs} as the power source of the amplifier. Furthermore... influences from changes and fluctuation in transistor characteristics and fluctuation in source voltage are alleviated." (Column 17 lines 25-34). I therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use a larger Voltage (i.e. higher supply voltage) source for the driver (input) than the modulation circuit (output) to have a large control range. Also it would have been obvious because fluctuations in the source voltage are alleviated.

Claims 8 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thompson (US 5444728) in view of Kaminishi (US 6618406).

As for claim 8 Thompson discloses all that pertains to claims. However

Thompson does not explicitly disclose that the input and output circuits of the small swing differential circuits use different supply voltages. Kaminishi discloses, "Since the control range of the DC bias current is large, here is used V_{cc} larger than V_{cs} as the power source of the amplifier. Furthermore... influences from changes and fluctuation in transistor characteristics and fluctuation in source voltage are alleviated." (Column 17 lines 25-34). Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use a larger Voltage (i.e. higher supply voltage) source for the driver (input) than the modulation circuit (output) to have a large control range. Also it would have been obvious because fluctuations in the source voltage are alleviated.

As for claim 22, Thompson discloses all that pertains to claim 1 respectively. However Thompson does not disclose that the input and output circuits of the small swing differential circuits use different supply voltages. Kamanishi discloses, "Since the control range of the DC bias current is large, here is used V_{cc} larger than V_{cs} as the power source of the amplifier. Furthermore... influences from changes and fluctuation in transistor characteristics and fluctuation in source voltage are alleviated." (Column 17 lines 25-34). Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use a larger Voltage (i.e. higher supply voltage) source for the driver (input) than the modulation circuit (output) to have a large control range. Also it would have been obvious because fluctuations in the source voltage are alleviated.

Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thompson (US 5444728) in view of Trotter et al. ("A CMOS low voltage high

Art Unit: 2828

performance interface" Trotter, J.D. Rekhi, S. Chava, V. Kale, P.C.; Microsyst. Prototyping Lab., Mississippi State Univ., MS, USA; ASIC Conference and Exhibit, 1994. Proceedings. Seventh Annual IEEE International; 19-23 Sept. 1994; pgs 44- 48, Rochester, NY).

As for claim 10 and 11, Thompson discloses all that pertains to claim 1.

Thompson further discloses, a signal transmission line (D1 or D2) configured to connect the modulation signal generating unit 32 and the driving unit (30 and 24), through which said pair of small swing differential signals propagate (at D1 and D2). However Thompson does not disclose using parallel resistors at both ends of the transmission lines. Trotter discloses, "Parallel termination techniques with the voltage dividers (resistors) at each end of the bus matching characteristic impedance are preferred. In this case, there are no reflected waves (currents) and the initial signal is at full magnitude" (pg 47, second column 7th-3rd line from the bottom). Therefore it would have been obvious to terminate both ends with resistors (voltage dividers) to prevent reflection of the voltage.

Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Thompson (US 5444728) in view of Canright ("Practical design for controlled impedance" Canright, R.E., Jr. Martin Marietta Electron. Orlando, FL, USA; Electronic Components and Technology Conference, 1991. Proceedings. 41st: 11-16 May 1991; pgs. 370 - 377; Atlanta, GA).

As for claim 19, the laser modulating and driving device of claim 1, wherein the modulation signal generating unit has an output-stage inverter or buffer. However Thompson does not disclose a resistor in series with the buffer. Canright discloses "... even though the tolerance was allowed on the series termination resistor, the series termination produced a larger tolerance on Z0... Larger manufacturing tolerances are desirable" (pg 376 column 1 lines 2-7). Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use a series resistor on the transmission line, D1 and D2 (which is in series with the buffer), to allow for a larger tolerance.

Conclusion

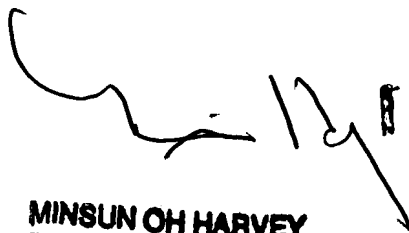
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tod T. Van Roy whose telephone number is (571)272-8447. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Minsun Harvey can be reached on (571)272-1835. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2828

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TVR



**MINSUN OH HARVEY
PRIMARY EXAMINER**